

Rhodora

JOURNAL OF THE
NEW ENGLAND BOTANICAL CLUB.

Conducted and published for the Club, by

BENJAMIN LINCOLN ROBINSON, Editor-in-chief.

FRANK SHIPLEY COLLINS

MERRITT LYNDON FERNALD

HOLLIS WEBSTER

} Associate Editors.

WILLIAM PENN RICH

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} Publication Committee.

VOLUME 2,

1900.

Boston, Mass.
740 Exchange Building.



Providence, R. I.
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THE DWARF MISTLETOE IN NEW ENGLAND.

Arceuthobium pusillum, Peck, the dwarf mistletoe, is without doubt one of the most interesting plants in our New England flora. As a flowering parasite it is, we believe, unique for this region in germinating directly upon the host-plant. Its parasitism is therefore unusually continuous and undoubtedly of long standing, — a fact shown both by the absence of green coloring-matter and by the extreme reduction of the leaves, which appear only as scale-like rudiments. It is probable that the dwarf size is also a characteristic acquired after the development of the parasitic habit, since as parasitism advances the stem as well as the leaf ceases to have its usual physiological significance and, except in cases like the dodder where the stem functions as a running root-stock, it is apt to decrease in length and even disappear altogether as in parasites like *Apodanthes* or *Rafflesia*, in which the flowers are essentially sessile upon the host-plant. *Arceuthobium pusillum* is also interesting from the fact that it is in the northeastern United States an outlying representative of the large and chiefly tropical family of the *Loranthaceae*, to which belong also the true mistletoe of Europe, *Viscum album*, L., and the false or American mistletoe, *Phoradendron flavescens*, Nutt. The latter plant occurs from New Jersey to Ohio, Missouri, and southward. The tropical members of the family, of which there are more than five hundred species, exhibit by their yellow-green and olive-brown color all stages in the degeneration of their assimilative tissue. Some of them have, however, unlike our northern species, rather large and showy flowers.

Through the kind co-operation of Messrs. von Schrenk, Jack, Jones, Eggleston, and Fernald, who have made independently a number of almost simultaneous discoveries relative to the dwarf mistletoe, it is possible to present at one time the following papers which greatly

extend the records of the species. We are also indebted to Mr. C. E. Faxon for his detailed drawings, and to Mr. F. Schuyler Mathews for the skillful retouching by which the photographs have been prepared for half-toning.

NOTES ON ARCEUTHOBIUM PUSILLUM.

HERMANN VON SCHRENK.

(Plate 12.)

IN the latter part of the year 1871, Mrs. Lucy A. Millington found a small mistletoe on the black spruce, *Picea Mariana*, B.S.P. (*P. nigra*, Ait.) at Warrensburg, Warren County, New York and about the same time Prof. C. H. Peck discovered the same plant at Sandlake, Rensselaer County, New York. Specimens were sent to Dr. Engelmann who recognized in the plant an *Arceuthobium* which he called *Arceuthobium minutum*.¹ Much astonishment was expressed at the time that this curious plant had not been found before, and we find numerous accounts of it in the periodical literature of that day.² Collectors searched for new stations with great zeal and a number of these were found in New York (notably in Sullivan County), in Pennsylvania, and in New Hampshire. The mistletoe in all these localities was confined to the black spruce, growing in cold sphagnum bogs. Peck described the plant in 1872, as *Arceuthobium pusillum*.³

For many years nothing more was heard of the plant. A number of species, many of which had extended ranges, were found on various Coniferae in the far west. Recently the interest in this, the smallest of the mistletoes, revived and several observers report finding it in localities not known before, from Vermont, Massachusetts, and Maine.

During the past summer a group of white spruces on Monhegan Island (near Boothbay Harbor), Maine, was found covered with the *Arceuthobium*. The trees were much stunted, some of them were dead, and the living ones formed a striking contrast to their healthy neighbors, because of their short yellow leaves. It was thought rather

¹ Bull. Torr. Bot. Club **2**: 43, 1871. Proc. Acad. Sci. St. Louis **3**: LXXXIII, 1873 (presented May 20, 1872).

² Bull. Torr. Bot. Club **2**: 42, 47, 48, 1871; **3**: 24, 55, 1872; **4**: 15, 44, 1873. Proc. Acad. Sci. St. Louis **3**: LXXXIII, 1873. American Naturalist **6**: 166, 406, 1872.

³ Peck, C. H., 25 Ann. Report State Botanist, N. Y., p. 69, 1873.

odd that the mistletoe should occur on an island at least five miles from the nearest mainland, and a vigorous search was made on the coast of the mainland for the plants. Hundreds of trees were found about Boothbay Harbor and Linekin, on which the mistletoe grew in quantities. The trees attacked varied from such as were but a few feet in height to the tallest in the forest, often eighty feet in height. The affected trees all grew within an eighth of a mile of the shore. This local distribution is probably due to the fact that an atmosphere laden with moisture is necessary in order that the seeds may be properly discharged. The fogs which are so prevalent during the months of August and September bring about these conditions, which will be most favorable near the coast.

As the accounts which have appeared up to this time give but short and scattering notes, a brief description of the plant may be of interest. In the unpublished notes of Dr. Engelmann, there are many drawings and descriptions, made at the time when the plant was discovered, which will be published, together with a fuller account of the plant and its western allies, in a more extended form.

The mistletoe is usually found on the younger branches of the spruces.¹ Many stems grow out from the host branch, sometimes twelve to sixteen stems in an inch. The individual stems vary between wide extremes as respects size and color. Both characters depend so much on the vigor of the host branch that this variability is to be expected. On very strong branches the stems are dark brown, almost black, and vary from half an inch to an inch or more in height. On weaker branches the plants are paler in color, and usually have a more spindling shape. The vigor of the host plant is, however, not the only factor, exposure to the direct rays of the sun, the number of stems in a given length of the host stem, and probably other factors determine the character of each stem. One finds strong, dark-colored stems in the midst of a dense broom, and, again, very pale ones.

The influence of the *Arceuthobium* on its host is probably the most marked feature of this interesting plant. In many cases where a parasite attacks a host-plant, the latter reacts in one way or another, as if stimulated. Increased growth takes place, new tissues and organs are formed, which are in striking contrast to the normal habit of the host. *Arceuthobium pusillum* stimulates its host to a greater degree

¹ In the following, by spruce, *P. Canadensis*, B. S. P. (*P. alba*, Link), will be understood.

than its western relatives do theirs. The stimulus takes the form of an increased growth, both in length and in the number of branches. This growth is of two kinds. If a seed germinates on a weak branch, which is shaded or much crowded, the affected branch grows to be several times its normal length. After several years a very open system of branches has resulted. The lateral branches of the spruce are but one or two inches apart; but on a large branch affected with the mistletoe, the points where lateral branches leave the main branch are often eight to twelve inches apart. Where a seed falls on a vigorous branch a very different form of branching results. Two stages of this are represented on the accompanying plate. The small branchlet nearest the germinating seed assumes a vertical position, and grows abnormally long during the first year. The next year several branches appear at its base, and both the main shoot and these fringing branches shortly give rise to others. After several years a very decided clump of branches grows in the form of a small bush, standing vertically on the horizontal branch. The small bush or broom gradually appropriates the food supply of the branch, and that part of the main branch beyond its base gradually weakens and dies. Thus it may happen that ultimately the broom appears to be at the end of a strong branch. These brooms grow to be very large. On some of the tall spruces several were measured which were two feet wide and four feet high. A tall spruce covered with these brooms is truly a strange object.

The leaves of the lengthened stems as well as those on the brooms are very much shorter than the normal spruce leaves, and paler in color, often quite yellow. The age of the brooms varies with the vigor of the host tree. The brooms when once they cover a tree are a great strain on its vitality, and it very soon weakens and dies. Dead trees with the old brooms are surprisingly numerous on that portion of the Maine coast alluded to. That this seemingly obscure plant is very destructive to the spruce is evident. After the parasite has once obtained a foothold in a group of spruces, it will not be long before all are affected, thanks to the effective bombardment of their branches by the small fruit mortars.

The manner in which the seeds are disseminated differs but little from that recently described by MacDougal.¹ A fact which Mrs. Millington speaks of in a letter to Dr. Engelmann is the way in which

¹ MacDougal, D. T. Seed dissemination and distribution of *Razoumofskyia robusta* (Engelm) Kuntze, Minn. Bot. Studies 2 Series, pt. II, p. 169, 1899.

the stems bend toward the newer branches as the seeds ripen. This was very marked on the spruces about Linekin. Towards the latter part of September, the stems became inclined towards the outer part of the tree. This brought the axes of the berries into a line almost parallel with the branch upon which the plants grew, i. e., with the ends from which the seeds were to fly toward the outside of the tree. The last week in September, the berries were ripe, and every day the seeds were shot out, flying out upon the newer branches. The manner in which the spirally marked hairlike cells glue the seeds to the bark will later be described more in detail.

The longitudinal arrangement of the stems on a branch has given rise to the supposition that they spring from longitudinal rhizomes, which grow in the bark of the host. This system of rhizomes is a very complex one. A network of threads grows out from the base of each stem, one thread fusing with another before long. From these threads the actual absorbing organs, the haustoria, are developed much as in the true mistletoes.

The distribution of this mistletoe is an interesting one. There seems to be little doubt now that birds in some cases carry the seed from place to place, for they must have carried them to Monhegan Island. Its occurrence in moist swamps and along the coast has been alluded to, and it is to be hoped that collectors in the New England States will watch for the plants, that we may be able before long to establish a complete chain from its furthest western to its most eastern station. Specimens will gladly be supplied on application.

SHAW SCHOOL OF BOTANY.

EXPLANATION OF PLATE 12.—Fig. 2. Horizontal branch of white spruce, *Picea Canadensis*, B. S. P. (*P. alba*, Link) with very young witches' broom. The latter is two years old. Note the strong buds on the branches of the broom, both terminal and lateral. About one-fourth natural size. Fig. 1. Older witches' broom of the white spruce. The stems of the *Arceuthobium* cover the branches, but are too small to be visible in the photograph. Note how the terminal part of the main horizontal branch is dying, also how the main stem of the broom is now thicker than the original host branch. Note the length of the annual growth of the broom branches, compared with that of the host branch. About one-fourth natural size.

ARCEUTHOBIUM PUSILLUM IN MASSACHUSETTS.

J. G. JACK.

(Plate 13.)

UNTIL the spring of 1898, the only localities in New England in which the so-called Small Mistletoe, *Arceuthobium pusillum*, had been found and reported by botanists were Lebanon and Canaan, New Hampshire, where it was collected by Prof. H. G. Jesup in 1883, and the station near Shelburne, New Hampshire, discovered in September, 1885, by Professor W. G. Farlow. It has been long known in the Adirondacks in New York State, and has been found in Pennsylvania.

It is only during the past two years that several new stations have been added to the range of the plant in New England, and further investigation will probably show it to be more generally distributed than is commonly supposed.

In the course of an examination of some lands appropriated by the Metropolitan Water Board, in the region about Boylston, Massachusetts, for the purpose of establishing the Wachusett Reservoir, and increasing the water supply for Boston and adjacent towns, I found this little parasite upon the Black Spruce, *Picea Mariana* (*P. nigra*, Link) growing in a small sphagnous swamp less than a mile north of Boylston station on the Massachusetts Central railroad. It is two and a half miles from West Boylston station or almost half-way between it and the Clinton station and nearly in a straight line between the two, close to the point where the Boylston, Clinton and Sterling township lines adjoin, most of the swamp being in the latter township. The location is approximately thirty-five miles west of Boston.

This swamp is about three hundred and seventy-five feet above sea-level and the area covered by Spruce affected by the Mistletoe is not more than six or eight acres in extent. In no case were the spruces more than twenty feet in height, averaging less than half that stature and especially dwarf on the more boggy or "quaking" parts of the swamp. With them were associated small Red Maples, Larches, Alders, Andromedas, *Kalmia angustifolia* and *Kalmia glauca*, *Gaylussacia resinosa*, and other trees and shrubs usually found in such situations, besides trailing cranberries, pitcher plants, etc.

The mistletoe was first discovered upon the spruce branches on April 21, 1898. It was then apparently in full bloom, the yellow

anthers of the staminate plants causing them to be much more conspicuous than the pistillate plants, which are not so likely to be noticed in flower unless sought. The date of flowering is interesting because in botanical publications it is usually given as June. When the plants under consideration were again examined on May 9 the staminate flowers had nearly all faded away. They are brownish and composed of a usually three- or four-parted calyx, upon each segment of which a sessile anther is borne, which is the most conspicuous part of the blossom when the yellow pollen is exposed.

This mistletoe is dioecious and the staminate and pistillate flowers are usually found on separate spruces or host plants, but sometimes on different branches of the same tree.

At maturity this little parasite rarely approaches an inch in length; most commonly it is less than half an inch long, the pistillate or fruiting plants apparently averaging longer than the staminate. The stems are greenish or greenish brown, slender, cylindric, usually less than a sixteenth of an inch in diameter, generally simple, sometimes with short opposite branches.

The stems are practically biennial, attaining full growth during one season, flowering and fruiting the next, after which they fall away and only the stem scars remain on the bark of the host. The staminate plants fall away in spring or early summer, soon after flowering, the pistillate not until after maturing of fruit in the autumn.

The mistletoe spreads with the growth of the twigs by means of haustoria or suckers beneath the bark of the host, and, in the autumn, small dark buds may be seen protruding through the bark of that portion of the twig which grew the preceding year, these developing into full sized plants the following year, having well developed flower buds which open the succeeding spring; so that the living plants of the parasite, in some stage, are to be seen in three growing seasons before they finally drop off.

In the autumn the fruiting mistletoe is found on the fourth year of growth back from the tip, while the plants for the next year occupy the next later growth or that of the third year preceding.

In this latitude the fruit ripens in the latter part of September. It is then of a translucent dull purplish color.

When ripe, the seeds are violently expelled from the berries at the moment that the latter become separated from their stalks, and a mucilaginous matter attached to the seeds causes them to stick to other

parts of the host or other plants in the vicinity, upon which they germinate, under favorable conditions.

The manner of seed expulsion in this genus, as seen in some western species, has been described by D. T. MacDougal in *Minnesota Botanical Studies*, 2nd series, part ii., February 22, 1899, p. 169-173.

No opportunity was obtained for observing the actual expulsion of seed from the Boylston plants, but this was seen very well in fresh specimens growing on white spruce in Maine, kindly furnished by Dr. Hermann von Schrenk.

The mistletoe at Boylston, as yet the only known locality for it in Massachusetts, is now nearly extinct, and will soon be completely eradicated, because, in the summer of 1898, the host-plants and other trees and shrubs were cut and burned to clear the ground for surveyors, and only a few small fragments of the mistletoe-bearing host escaped alive. These will soon be obliterated, because the swamp is to be filled or thoroughly cleaned out, and the pure waters of the reservoir will eventually flow over it.

This *Arceuthobium* may be found in other localities not far away. In looking for it, the hunter will be aided by the fact that the affected host-plants often appear distorted or stunted in comparison with perfectly healthy trees.

In the accompanying plate, generously furnished by Mr. C. E. Faxon, the figures have been drawn from specimens growing on black spruce collected in the Boylston locality.

ARNOLD ARBORETUM.

EXPLANATION OF PLATE 13. — *Arceuthobium pusillum*, Pk. Fig. 1, branch of black spruce in spring, with staminate *Arceuthobium* in flower; *a*, twig one year old; *b*, twig two years old; *c*, twig three years old. Fig. 2, branch in autumn with pistillate plants and fruit; *a*, twig one year old; *b*, twig two years old showing buds of the parasite; *c*, twig three years old with full-grown *Arceuthobium*; *d*, twig four years old with fruiting plants. Fig. 3, plant with mature fruit. Fig. 4, staminate plant in flower. Fig. 5, pistillate plant in flower. Fig. 6, staminate flowers. Fig. 7, pistillate flowers. Fig. 8, the same in vertical section. Fig. 9, fruit, showing manner of dehiscence and seed expulsion. Fig. 10, seed. (Figs. 1 and 2, natural size; figs. 3 to 10, enlarged.)

ARCEUTHOBIMUM PUSILLUM ON A NEW HOST IN VERMONT. — I have been confident for several years that *Arceuthobium pusillum*, Pk., must occur in Vermont. The black or swamp spruce, its usual host, is common in the sphagnum swamps of the Champlain valley and elsewhere in the state. Professor Peck finds the *Arceuthobium* in the Adirondack

regions, and Professor Hudson, of Plattsburgh, told me last year that he had found it a few miles south of that city, near the shores of Lake Champlain.

Persistent search on the Vermont side of the lake failed to show the parasite until this summer. Mr. W. W. Eggleston, of Rutland, wrote me in June that he had at last discovered it in a spruce swamp near that city. Early in August I visited a large black spruce swamp on the south end of the Alburgh peninsula, which divides the northern end of Lake Champlain into two arms. Here, at last, my own search was rewarded. A considerable per cent of the black spruce trees showed abnormal growths or "Hexenbesen" (witches' brooms). These abnormal branches, in all cases examined, were hosts of the *Arceuthobium*. No flowering or fruiting specimens of the parasite were observed at this time.

Upon again visiting the swamp the last week of September to obtain these, a similar "Hexenbesen" was observed in a medium-sized specimen of the tamarack, *Larix Americana*. Examination of this revealed scattering plants of *Arceuthobium* upon the deformed branches. The relative number of these upon the tamarack in proportion to the size of the "Hexenbesen" was small, however, probably not above one per cent of that found upon similar spruce branches. The individual plants of the parasite were of about the size and appearance of those found on the spruce. No fruiting plants occurred.

Time did not permit of much further search, and no other "Hexenbesen" was observed on tamarack. A photograph of the infested tamarack branch was made and is communicated with this article.

A number of herbarium specimens were taken of the parasite as it occurs on spruce, and I shall be glad to send these upon request to botanists who are interested in this curious plant.—L. R. JONES, Botanical Laboratory, University of Vermont.

EXPLANATION OF PLATE 14.—Witches' broom formed on *Larix Americana* as a result of the parasitism of *Arceuthobium pusillum*; from a photograph.

FURTHER NOTES UPON THE DISTRIBUTION AND HOST PLANTS OF *ARCEUTHOBIUM PUSILLUM*.—When the 6th edition of Gray's Manual was published in 1889, the tiny parasite *Arceuthobium pusillum* was known only from the Adirondacks, Hanover, New Hampshire, and Pocono Mountain, Pennsylvania. It now appears, however, to be

rather common in the northern half of New England, and the fact that it has been so long overlooked is doubtless due on the one hand to its small size, and the other to its peculiar mode of growth upon branches of trees and often out of reach. At Hanover, New Hampshire, it was discovered by Professor Jesup, and grew upon the black or swamp spruce (*Picea nigra*, Link). Knowing the plant well at that station, some ten years ago, the writer has since spent much time in searching for it in Vermont, and was finally rewarded, May 6, 1899, by finding a new station at Pittsford, Rutland county. It was there growing on the black spruce in a small swamp, which had been searched several times before.

In June the writer found the *Arceuthobium* again on Bald Mountain, Mendon, at about 2,200 feet altitude, and in this case upon the red spruce (*P. rubra*, Link).

Prof. L. R. Jones' interesting discovery of the species at Alburgh, Vermont, on the black spruce, and later upon the tamarack (*Larix Americana*, Michx), is described in his article published above.

President E. Brainerd has since found the *Arceuthobium* on the black spruce at Ripton, Vermont, and Prof. C. E. Peck tells me that it has been sent to him from the Adirondacks this fall on the branches of the white spruce (*P. alba*, Link). Although it has thus been observed upon no less than four species, the writer believes that it occurs chiefly on the black spruce.—WILLARD W. EGGLESTON, Rutland, Vermont.

ARCEUTHOBIMUM PUSILLUM IN THE ST. JOHN AND ST. LAWRENCE VALLEYS. — Late in September last, while crossing a low spruce swamp near Fort Kent in northern Aroostook county, Maine, the recollection of Dr. von Schrenk's interesting discovery of the dwarf mistletoe in the southern part of the state occurred to me, and I thought: "Why shouldn't I find *Arceuthobium*, too?" Instantly, upon looking up, I saw a sickly black spruce loaded with the small fruiting parasite. The plant covered many of the small black spruces; but though the white spruces, firs and hackmatacks were carefully examined, none of them seemed to harbor the mistletoe. Nor was any strong tendency to *Hexenbesen* seen in the affected trees, such as has been noted in other regions by Dr. von Schrenk and Professor Jones. The only marked effect of the parasite upon the host-trees was a tendency to produce unusually slender branchlets and yellowish foliage.

In other swamps of the region the formula was repeated which preceded my discovery of *Arceuthobium*, but the charm seemed to have vanished, for I was unable to induce more of the mistletoe, or any *Scolopendrium* or other plants which I thus sought, to appear before me. Later in the week, however, I drove through a spruce-swamp several miles south of Fort Kent, in the Swedish town, Upsala, and there several of the trees were dying from the effect of the little mistletoe. These stations are interesting as giving a considerable north-eastern extension of the recorded range of the parasite.

The French and English people at Fort Kent, to whom I showed my treasures, expressed little surprise, for, according to them, branches bearing the plant are frequently brought in by woodsmen. One woman, whose observations upon the native plants are generally accurate, stated that at a grand mid-winter ball at Tadoussac, at the mouth of the Saguenay, she had seen many of the women wear in their hair the twigs covered with the purplish brown fruit. Whether they realized that the little plant was a mistletoe and whether it had with them the traditional significance of the European plant, she could not state.—
M. L. FERNALD.

NOTES ON ALGAE,—II.

FRANK S. COLLINS.

A FEW species of marine algae, new to this region, have been noticed lately; they are mostly inconspicuous plants, as is to be expected in a region whose marine flora, not exceptionally rich in species, has been so long studied; and it is probable that of such minute species, many still remain for future discovery.

Phormidium persicinum (Reinke) Gomont, with extremely slender filaments, barely 2μ in diameter, forms a thin, pink film on shells, mostly on the Spirorbis which is often attached in great abundance to larger algae, especially *Fuci*, *Laminariae*, etc. In the present case the Spirorbis was on *Rhodymenia palmata*, found floating at Nahant, Mass., in June, 1899. The species was described by Reinke, as a *Lyngbya*, in the *Algenflora der Ostsee*, p. 91; the description is reproduced, under *Phormidium*, at p. 184 of Gomont's *Monographie des Oscillariées*.

Chlorochytrium Schmitzii Rosenvinge, a green alga of very simple structure, occurs among the erect filaments of such algae as *Cruoria pellita*, in which it was first found by Rosenvinge; it is described and

figured in Grönlands Havalger, p. 965, fig. 56. The writer found it scattered rather sparingly among the filaments of *Petrocelis cruenta* J. Ag., at Seal Harbor, Mount Desert, Maine, in July, 1899.

In company with the last-named species was another green alga, *Codiolum Petrocelidis* Kuckuck, Wissentliche Meeresuntersuchungen, New Series, vol. i, p. 259, fig. 27. The two are not likely to be confounded, as the *Codiolum* is drawn out below into a slender stipe, while there is no stipe in the *Chlorochytrium*. The history of this alga is rather curious. It was described and figured in 1865 by Cohn, in Rabenhorst, Beiträge zur Kenntniss und Verbreitung der Algen, Heft 2, p. 33, but under the supposition that it was a rudimentary state of a *Cladophora*. It is referred to by Farlow in the Manual of the New England Marine Algae, in 1881, but without a name. In Hedwigia, vol. iv, p. 125, 1886, Wollny incorrectly referred it to *Codiolum gregarium*, and it received a name of its own only in 1894, twenty-nine years after it was described and figured, quite accurately.

Ralfsia Borneti Kuckuck, Meeresuntersuchungen, vol. i, p. 245, fig. 15, was found by the writer at Seal Harbor in July, 1899, growing on a small pebble below low water mark. There was nothing external to distinguish it from the common *R. verrucosa*, but the free filaments accompanying the unilocular sporangia are very slender below, the lower cell being even twenty times as long as broad, and nearly, if not quite, colorless; the upper cells are shorter than broad, with dark chromatophors. The plurilocular sporangia, described by Kuckuck, were not found; they are quite different from anything found on our American species of *Ralfsia*.

Rhodochorton parasiticum Holmes, seems to be not uncommon on *Laminaria* from Cape Ann, north. The writer has found it on *L. longicruris* and on *L. digitata*, especially on the larger forms of the latter, with flattened stipe. When well developed, it covers the stipe with a dense red plush. It resembles *R. Rothii* Naeg., common on rocks along our coast; but the basal filaments, instead of forming a horizontal layer, penetrate rather deeply into the substance of the host.

Ulothrix variabilis Kuetz. var. *marina* Wille, has been found by Isaac Holden in brackish water at Bridgeport, Conn. It has slenderer filaments than any other of our marine *Ulothrix*, 5-7 μ diameter; it has been distributed as No. 615 of the Phycotheca Boreali-Americana.

In the Bulletin de la Société Botanique de France, vol. xlvi, Gomont describes two new species of *Plectonema*, occurring within

our limits. *P. calothrichoides*, p. 30, Pl. I., figs. 6–10, was found, in company with various other *Schizophyceae*, by the writer at Nahant, Mass. The trichomes are from 2 to 2.5μ in diameter, with short articulations; the sheath, quite thick and dark colored in the middle of the filament, becomes extremely thin and colorless at the extremities, giving a *Calothrix*-like appearance, though the trichome does not taper.

P. Golenkinianum, p. 35, Pl. I., fig. 11, founded on a plant growing in a tank at the Biological Station at Naples, was found also in a mass of various minute algae, growing on overhanging rocks, Eagle Island, Penobscot Bay, Maine. The stratum is of a rosy or brownish red, the trichomes even thinner than in *P. calothrichoides*, 1.2 to 2μ diameter, the sheaths of uniform thickness.

These two species have been distributed in the *Phycotheca Boreali-Americana*, under Nos. 604 and 603 respectively.

There have been some algae recently distributed in the *Phycotheca*, from New England localities, as new forms or varieties; for the purpose of removing any doubt that might exist of the validity of descriptions, published only in labels, they are here reproduced.

CALOTHRIX FASCICULATA forma **incrustans** Collins. *C. Contarenii* Collins in Bulletin Torrey Bot. Club, vol. xviii, p. 336, 1891; not of Bornet & Flahault. On rocks in littoral zone, Revere Beach, Massachusetts, September 29, 1895. No. 561. Filaments slenderer than in type, .008–.012 mm. diam.; habit like *C. Contarenii*; forming a smooth incrustation on rocks, so dense that it can often be stripped off in the same way as *C. pulvinata*.

VAUCHERIA PILOBOLOIDES var. **compacta** Collins. Mystic River Marshes, Malden, Massachusetts, September, 1897. No. 477. Forming a plush-like mass among *Salicornia*, etc., on ground overflowed at high tide only. Habit like *V. Thuretii* Woronin; the stratum so dense that large sheets can be cut out with a knife, and lifted up. Dimensions of filament as in typical *V. piloboloides*; oogonia and antheridia as in type, except that the oospores are usually spherical, but sometimes lentiform; oogonia and antheridia scattered over the filaments, not in any apparent definite relation to each other.

ECTOCARPUS CONFEROIDES (Roth) Le Jolis, forma **brumalis** Holden. On muddy turf of *Spartina* roots, near high water mark, Charles Island, near Milford, Connecticut, December 25, 1898. No. 576. A winter form; fronds mostly 1–2 cm. long; main filaments about .025 mm. diam.; branches .012–.020 mm. diam. Plurilocular sporangia varying much in shape, from cylindrical to shortly conical; length sometimes over .15 mm.; width .015–.025 mm.; often curved

and distorted; either sessile or terminal on a branch of one to many cells. Unilocular sporangia unknown.

FUCUS VESICULOSUS forma **gracillima** Collins. Among Spartina, etc., on muddy bank between tide-marks, Eastham, Massachusetts, September, 1888. No. 578. With oospores. A very slender form, without vesicles, and with receptacles linear to filiform. It is probably only a growth form, but unlike most of the dwarf forms of this species, it fruits freely.

THE WALKING-FERN IN WORCESTER COUNTY, MASSACHUSETTS. — In the October issue of RHODORA (p. 181.) Mr. T. O. Fuller reports the occurrence of *Camptosorus rhizophyllus*, Link, at Needham, only a few miles from Boston. He quotes also a statement that this is the only reported station for this local and highly characteristic fern east of Mt. Tom, or more properly of Mt. Toby. However, although hitherto unrecorded in print, there is a station in Worcester County in the town of Brookfield. At this place the species is scarce and grows, as usual, in crevices of rock, with every appearance of an indigenous plant. This new and intermediate station although only a few miles to the eastward of Mt. Toby, still diminishes somewhat the gap between the previously known stations, and therefore renders the indigenous nature of the Needham occurrence a little more probable.

In connection with the *Camptosorus*, I may mention another fern, which is extremely local in Massachusetts, namely, *Pellaea atropurpurea*, Link. This is given in the Amherst Catalogue only as occurring at Mt. Toby. It has, however, been found sparingly at a solitary station in the town of Berlin, Worcester County, growing upon a ledge containing a small percentage of lime which is characteristic of certain parts of the Nashua Valley formation. It is interesting to note in connection with the occurrence of this species at Berlin, the relationship of the substratum to its distribution. — G. E. STONE, Agricultural College, Amherst, Massachusetts.

SOME NORTHEASTERN SPECIES OF SCIRPUS.

M. L. FERNALD.

IN a recent preliminary discussion¹ of the "wool-grasses" it was shown that in the northeastern states there were two very distinct specific types which had long been confused as *Scirpus Eriophorum*. Since that time a large amount of material has been furnished by Dr. K. M. Wiegand, of Cornell University, showing a third species which is abundant in western New York, and during the past year field observations of the plants were carried on by the writer in southwestern New Hampshire, and a very exhaustive study of the group in Vermont has been made by President Ezra Brainerd. Specimens and critical notes have also been prepared by Mr. O. A. Farwell in Michigan, by Mr. C. H. Bissell in Connecticut, and by several others who have kindly placed at the disposal of the writer the results of their studies. In this more extended examination of the "wool-grasses" special aid has been rendered by the discriminating observations and criticisms of President Brainerd of Middlebury College.

From these more detailed studies it seems probable that, in the desire to avoid too radical a treatment of the plants, the northern *Scirpus cyperinus*, Kunth, was erroneously called a variety of the southern *S. Eriophorum*, Michx. The latter species, when mature, is of a pale terra-cotta brown, having a decidedly reddish tinge; and the sheaths of its involucre and involucels are for the most part of a deeper shade of the same color. The rays of the umbel are mostly ascending, but the numerous raylets are slender and drooping. The spikelets are usually in 3's, the middle one sessile, the two outer on more or less elongated pedicels. This plant, characterized by its terra-cotta color and slender-pedicelled spikes, is abundant on the southern coast of the United States extending north into New Jersey. Southward it matures in late July and August, but in Virginia its "wool" becomes conspicuous in September.

The common northern plant, *Scirpus cyperinus*, which in the former treatment was called a variety of *S. Eriophorum*, seems now, from a study of material from many localities, to be so clearly distinct from the southern plant as to warrant its recognition as a species. When

¹ Contrib. Gray Herb. n.s. XV. (Proc. Am. Acad. xxxiv. 498). See also synopsis in RHODORA, i. 137.

mature the woolly inflorescence is of a dull brown color with little or no suggestion of terra-cotta or reddish. The sheaths of the involuclers are generally a sepia or dark brown, and of the involucre a slightly paler tint. The raylets of the umbel are much less drooping than in *S. Eriophorum*, often very stiff and ascending, and the spikelets are all sessile in glomerules. In New England this species matures its fruit in late August and early September. The two extreme forms described as varieties *condensatus* and *Andrewsii* of *S. Eriophorum*, have their affinities much more with the northern *S. cyperinus*.

The other species, first definitely called to the attention of the author by Dr. Wiegand, proves to be abundant in the Connecticut Valley, and from there westward to Michigan and Wisconsin. It is essentially as stout as *S. cyperinus*, but in color the mature inflorescence is a pale yellowish brown, and the rays and raylets of the extremely dichotomous umbel are more slender and flexuous. The ultimate involuclers with brown, not terra-cotta sheaths, bear small umbels of from 2 to 5 spikelets, the central spikelets sessile, the others on slender pedicels. Thus in habit this northern plant with yellowish-brown inflorescence somewhat resembles the stouter southern terra-cotta colored *S. Eriophorum*. In addition to its difference of color and stoutness, the northern plant has shorter bristles, 5. mm. long, those of the southern plant averaging 7. mm. long.

In Virginia *Scirpus Eriophorum* is mature in September, but its northern representative with the pale yellowish-brown wool is fully mature in New England and New York in late July and early August.

The following forms of this group are now recognized in New England.

SCIRPUS CYPERINUS, Kunth, Enum. ii. 170. *S. Eriophorum*, Michx., var. *cyperinus*, Gray, Man. ed. 2, 501; Fernald, Proc. Am. Acad. xxxiv. 501.—Common throughout, mature in late August and early September.

S. CYPERINUS, var. ***condensatus***. *S. Eriophorum*, var. *condensatus*, Fernald, l.c.—Same range as species but less common.

S. CYPERINUS, var. ***Andrewsii***. *S. Eriophorum*, var. *Andrewsii*, Fernald, l.c.—Originally from Southington, Connecticut: recently collected at East Middlebury, Vermont, Sept. 11, 1899 (*Ezra Brainerd*).

S. pedicellatus. Tall (1.8 m. or less in height) and stout (culm, just below the involucre, 2 to 4 mm. in diameter): leaves 0.5 to 1 cm. wide: inflorescence resembling that of *S. Eriophorum*, with more slender unequal rays, but with none of the primary umbellules

elevated far above the others; the involucre and involucels brown not terra-cotta at base: spikelets ovoid-oblong, 4 to 6 mm. long, from 2 to 5 in clusters at the tips of the filiform flexuous branchlets, the middle spikelet sessile, the others slender-pedicelled: scales brown or yellowish-brown; bristles pale brown, 5 mm. long. — A characteristic plant, the northern representative of *S. Eriophorum*. Alluvial marshes and thickets, from the Connecticut Valley to Michigan and Wisconsin. Specimens examined: — NEW HAMPSHIRE, Walpole, Aug. 2 (over-ripe), 1899 (*M. L. Fernald*, Herb. Alstead School Nat. Hist. no. 1): VERMONT, North Hero, July 30, Aug. 6 (over-ripe), 1899; Knight's Island, Aug. 6 (over-ripe), 1899; Lake Dunmore, Aug. 15 (over-ripe), 1899; Woodbury, alt. 460 m., Aug. 22, 1899 (*Ezra Brainerd*): NEW YORK, Ithaca, July 11, 1893, July 15 (over-ripe), 1894, July 25 (over-ripe), 1895 (*K. M. Wiegand*): MICHIGAN, Troy, (*Houghton*): WISCONSIN, Alma, 1861 (*T. F. Hale*).

S. PEDICELLATUS, var. ***pullus***. Rays somewhat more unequal than in the species: spikelets duller brown and longer, 7 to 10 mm. long. — VERMONT, along Otter Creek, Middlebury, Aug. 11 (over-ripe), 1899 (*Ezra Brainerd*): MASSACHUSETTS, Williamstown, Aug. 9, 1898 (*J. R. Churchill*).

S. ATROCINCTUS, Fernald, l. c. 502. — Throughout New England, northward and westward, mature in late June and July, or in the mountains in early August. A very pale form, rather more lax than the type and with weaker coloring in the sheaths, has been collected in New Hampshire, Vermont and Michigan.

S. ATROCINCTUS, var. *BRACHYPODUS*, Fernald, l. c. 503. — Range of the species, but more common northward and at higher altitudes.

S. ATROCINCTUS, var. ***grandis***. Taller (1 to 1.8 m. high) and stouter throughout than the species; culm just below the involucre often 2 or 2.5 mm. in diameter: leaves 4 to 7 mm. wide: inflorescence generally longer than in the species, 2 or 3 dm. long, rays very unequal, some of the primary ones far overtopping the others: spikelets oblong, 7 to 10 mm. long, grayish brown. — NEW HAMPSHIRE, Alstead, Aug. 9, 1899 (*M. L. Fernald*, Herb. Alstead School Nat. Hist. no. 2): VERMONT, Middlebury, Creek Road, Aug. 11, 1899, Battell's Pond, Aug. 17, 1899 (*Ezra Brainerd*). An anomalous plant, from its coarse habit, somewhat brownish color, and rather late-flowering season suggesting a possible relationship with *S. pedicellatus*; but with the black involucre, grayish tinge in the spikelets, and elongation of some of the primary rays so characteristic of *S. atrocinctus*.

While collecting and studying this group of species some other *Scirpi* have been found which are undescribed or ordinarily misinterpreted. One of these, which so far as yet known is confined to the Connecticut Valley, was discovered in 1881 in Vermont, by the late Edwin Faxon and it has since been collected in that state by President

Brainerd, and in New Hampshire by the writer. It is a very handsome and unique plant, not closely related to any described species. In its achene it is near the *Scirpus Eriophorum* group, but the bristles are much shorter and less crinkled, and inconspicuous in the fruiting plant, in this character approaching *S. lineatus*. In its ascending stiffish rays and raylets, however, it is unlike any of those species. From the very dark color of its spikelets this plant may be called

S. atratus. Culms tall, 1 to 1.75 m. high, rather slender (just below the involucre averaging 2.15 mm. in diameter) : leaves averaging 7 (5 to 9) mm. wide : involucre black or black and chestnut-brown at base : inflorescence 1 to 2 dm. high, occasionally producing branches from lower sheaths ; umbel of many dichotomous rays of various lengths, 2 to 4 of them more elongated and ascending, the others shorter, somewhat divergent ; the raylets slender but stiff, scarcely drooping : spikelets oblong-lanceolate, about 8 mm. long, sessile or subsessile in clusters of from 2 to 6 : scales oblong-ovate, acute or obtusish, below pale or reddish-tinged, above blackish with a slight ferrugineous tinge : achene 1 mm. long, pale, 3-angled, obovate-oblong : bristles about 2.5 mm. long, curling when dry.— In a wet thicket, Alstead, NEW HAMPSHIRE, July 30, 1899 (*M. L. Fernald*, Herb. Alstead School Nat. Hist. no. 3). Formerly collected at Sutton, VERMONT, Aug. 11, 1881 (*Edwin Faxon*), and at Ripton, VERMONT, July 17, 1898 (*Ezra Brainerd*).

A common "bulrush" of northern New England and the region about the Great Lakes has been known in our floras as *Scirpus sylvaticus* var. *digynus*, Böckeler, or *S. microcarpus*, Presl. The history of the treatment of this common northeastern plant and its immediate congeners is interesting.

In 1828, Presl described his *Scirpus microcarpus*,¹ a plant with the "habit of *S. sylvaticus*," and with bifid style, the type specimens coming from Nootka Sound (west coast of Vancouver Island), and from Mulgrave (on Bering Straits). In 1836 Torrey, apparently unacquainted with Presl's species, described in his monograph² *S. lenticularis* from the "North-west Coast of America, near Observatory Inlet, *Dr. Scouler*," remarking that it is "nearly related to *S. sylvaticus* but differs in its larger spikes, lenticular nut, diandrous flowers, and bifid style ; that species [*S. sylvaticus*] having shorter spikes, a triangular nut, triandrous flowers, and a 3-cleft style." For *S. sylvaticus* he cited three stations : "Canada, *Michaux* ; Hudson's Bay Country, *Dr. Richardson* ; Island of Sitka, Russian America, *Mertens*,"

¹ Presl. Reliq. Haenk. i. 195.

² Ann. N. Y. Lyc. Nat. Hist. iii. 328.

observing, however, that "I have seen no North American specimens of this plant except those in Michaux's herbarium, which I did not examine with sufficient accuracy for determining whether they are identical with the *S. sylvaticus* of Europe." Thus in view of Torrey's note it seems that there was little left at that time to stand for the Linnean *S. sylvaticus* in America.

In the first edition (1848) of the Manual, Dr. Gray gave no recognition to any American form of this group but the well-marked *S. atrovirens*, Muhl. In the second edition (1856), however, *S. sylvaticus* was clearly described with a 3-cleft style and six bristles, but the range given was "N. New England and northward," and *S. atrovirens* was included under it as a variety. This disposition of the plants was followed until the fifth edition (1867) when *S. atrovirens* was reinstated as a species and the range of *S. sylvaticus* was given as "Base of the White Mountains, New Hampshire (*Oakes*), and northward." In a note Dr. Gray then added that "*S. microcarpus*, Presl., *S. lenticularis*, Torr., apparently a form of *S. sylvaticus* with a 2-cleft style and flat achenium, approaches our northwestern borders." Shortly thereafter, apparently in 1868, finding, as his pencil note indicates, that the *Oakes* specimen from the "base of the White Mountains" had lenticular achenes and four bristles, Dr. Gray marked upon the sheet "not *Scirpus sylvaticus*, L., but *S. microcarpus*." This seems to have been the first recognition of a plant in the east with these characters, so well known in the northwestern species.

Böckeler, in his monograph, two years later (1870), included *Scirpus sylvaticus* as a North American plant, but of *S. lenticularis*, Torr., he made the variety *digynus*¹ citing no specimens.

In the sixth edition (1889) of Gray's Manual, Böckeler's varietal name was taken up for the northeastern plant which in former editions had passed as true *S. sylvaticus*, *S. microcarpus*, Presl, being cited as a synonym: the name *S. sylvaticus* was at the same time rightly applied to a conspicuous plant which is common from Massachusetts southward, but which for some unaccountable reason seems to have escaped earlier recognition.

Prof. Britton was apparently the first to give *Scirpus sylvaticus* and the common plant of northern New England and Canada, with its 2-cleft style, recognition as a distinct species. In 1892, in his list of the species of *Scirpus*,² he considers the northeastern plant identical

¹ Böckeler, *Linnaea* xxxvi. 727.

² *Trans. N. Y. Acad. Sci.* xi. 74.

with the Pacific coast *S. microcarpus*, and in the Illustrated Flora the same name is given it. That the northeastern species, passing as "*S. microcarpus*," is clearly distinct from *S. sylvaticus*, there can be no doubt. The latter is a coarser plant, with conspicuously broader leaves and more ample inflorescence. The spikelets are rarely more than six or eight in a glomerule (generally fewer), and the rays of the umbel are ordinarily much more elongated. It has a uniformly 3-parted style and three stamens and usually six bristles, and the larger achene is darker colored and with a distinct ridge or angle on the back. This plant, the true *S. sylvaticus*, is of decidedly more southern range than the other, barely reaching southern Maine and New Hampshire, and from there extending southward to the Carolinas. In its flowering season, too, as shown by the dates on eighty herbarium labels of the two species, it is about *three weeks later* than the more slender northern plant.

Although the slender northeastern plant agrees with the northwestern and Pacific coast *S. microcarpus* in having 2-cleft styles and four bristles, and whitish barely angled achenes, there is little else to suggest their identity. The true *S. microcarpus* is as coarse a plant as the eastern and European *S. sylvaticus*. Its leaves are broad and its inflorescence ample, with long often flexuous rays. The spikelets are solitary or in glomerules of from 2 to 8. The upper sheaths of the plant in all the specimens examined are green or very slightly reddish tinged, and it is stated by those who know the plant in the field that in fresh plants there is no striking color in the upper sheaths. The more slender eastern plant, on the other hand, is quickly recognized by the deep purplish-red band at the base of each sheath, although this same color is occasionally seen in the otherwise dissimilar *S. sylvaticus*.

The northeastern species, from the apparent constancy of this marking, may be called

***S. rubrotinctus*.** Stem slender or rather stout, 4 to 9 dm. high: leaves smooth, 4 to 13 mm. wide, the upper equalling or slightly exceeding the umbel; the sheaths conspicuously colored with red or purplish brown; involucre leaves mostly 3, the longest sometimes exceeding the umbel: rays of the umbel numerous, the 3 to 5 longest ones 0.5 to 1.5 dm. long, stiff, ascending, subequal, the many shorter ones ascending or spreading; the branchlets and ultimate branchlets of the inflorescence stiff, not flexuous: spikelets 4 to 6 mm. long, ovate-oblong to cylindric, in glomerules of from 3 to many; scales

ovate, blunt, finely suffused with green and black: stamens 2: style 2-cleft: achene obovate, short-beaked, plano-convex on the back, whitish, 1 mm. long: bristles 4 (rarely 5), retrorsely barbed nearly to the base. — *S. sylvaticus*, Gray, Man. ed. 2, 3, 4, 5 as to range, but not description. *S. sylvaticus*, L., var. *digynus*, Wats. & Coult. in Gray, Man. ed. 6, 581, and most American authors, not Böckeler. *S. microcarpus*, Britton, Trans. N. Y. Acad. Sci. xi. 81, for the most part, and Britton & Brown, Ill. Fl. i. 269, mostly, not Presl. — The common representative of the *sylvaticus* group in the northern states and Canada. NEW BRUNSWICK, Grand Manan, July 30, 1891 (*J. R. Churchill*): QUEBEC, Gaspé Basin, July 24, 1882 (*Fohn Macoun*, no. 68); Natashquan River, July 14, 1895 (*Sinclair Kennedy*); Roberval, July 27 (over-ripe), 1892 (*G. G. Kennedy*): ONTARIO, Port Stanley, June 22, 1882 (*Fohn Macoun*): MANITOBA, Lake Winnipeg Valley, 1851 (*Bourgeau*): ASSINIBOIA, Swift Current, June 27, 1894 (*Fohn Macoun*, no. 7536): MAINE, Foxcroft, July 18, 1895 (*M. L. Fernald*, no. 301); Southport, Aug. 7, 1894 (*M. L. Fernald*), and abundant throughout: NEW HAMPSHIRE, White Mts. (*Oakes, Boott, Faxon*, et al.), ascending to 1300 m. on Mt. Clinton (*Kennedy & Williams*); Fitzwilliam, June 18, 1894 (*E. F. Williams*): VERMONT, Willoughby Lake, July 4, 1854 (*Wm. Boott*); Mt. Mansfield, Aug. 22 (over-ripe), 1880 (*C. G. Pringle*): MASSACHUSETTS, Medford, July 7, 1867 (*Wm. Boott*); Milton, June 5, 1890 (*G. G. Kennedy*); Canton, June 4, 1880 (*E. Faxon*); Dedham, June 17, 1891 (*W. P. Rich*): NEW YORK, Danube, Herkimer Co., July 15, 1863 (*C. F. Austin*): MICHIGAN, Keeweenaw Co., Aug., 1890 (*O. A. Farwell*, no. 549a): COLORADO, 1874 (*W. A. Henry*); Oak Creek, Fremont Co., 1873 (*T. S. Brandegee*): UTAH, Wasatch Mts., July, 1869 (*S. Watson*, no. 1215).

S. RUBROTINCTUS, var. **confertus**. Rays of inflorescence short: glomerules compacted into dense clusters 1.5 to 4 cm. in diameter. — Green, MAINE, July 10, 1878 (*F. Lamson-Scribner*). A dense-headed extreme parallel with *S. cyperinus*, var. *condensatus*, and *S. atrocinctus*, var. *brachypodus*.

S. SYLVATICUS, L., var. **Bissellii**. Spikelets linear or linear-oblong, 7 to 10 mm. long, in dense glomerules: sheaths conspicuously reddened below as in *S. rubrotinctus*. — In a swamp at Southington, CONNECTICUT, July 22, 1898, no. 716, July 6, 1899 (*C. H. Bissell*); July 23, 1898 (*Luman Andrews*). An extremely long-spiked form with the sheaths more brightly colored than in the species, suggesting *S. rubrotinctus*: in its 3-cleft style, pale brown definitely angled achene, and other floral characters, clearly an extreme form of *S. sylvaticus*. In its development of long narrow spikes this plant exhibits a tendency which is paralleled in other species of *Scirpus* — as *S. cyperinus*, var. *Andrewsii*, *S. pedicellatus*, var. *pullus*, and *S. atrocinctus*, var. *grandis* described above, and *S. polyphyllus*, var. *macrostachys*, Böckeler (*S. Peckii*, Britton).

TYPICAL GOODYERA REPENS IN NEW ENGLAND. — In RHODORA, i. p. 6, Mr. Fernald has separated our northeastern form of *Goodyera repens*, R. Br. with broad white borders along the veins of the leaf, as var. *ophioides*. The typical form, with somewhat larger leaves and dark veins, seemed to be restricted to alpine and extreme northern regions of both continents, though reported also from the slopes of Pike's Peak and from a few other stations in the Rocky Mountains. But we have now to record its discovery in New England and New Brunswick. It was collected on Mt. Kineo, Maine, Aug. 28, 1895 (in fruit), by Mr. J. G. Jack; on the Nepisiguit River, New Brunswick, in August, 1898, by Mr. G. U. Hay; and at Ripton (alt. 1300 ft.), Vermont, Aug. 9, 1899, by the writer. Specimens from the first and last stations are in the Gray Herbarium. — EZRA BRAINERD, Middlebury, Vermont.

HUDSONIA ERICOIDES IN NEW HAMPSHIRE. — I was surprised to learn from Dr. Robinson's list of New England *Cistaceae* (RHODORA, i. 212), that *Hudsonia ericoides*, L., has not been reported from New Hampshire. I have in my herbarium a specimen collected June 7, 1892, by Mr. H. E. Sargent at Concord, New Hampshire, an occurrence noteworthy, not only as the first recorded in this state, but as furnishing an inland station for a maritime plant. A portion of the specimen has been sent to Cambridge for deposit in the Gray Herbarium. — WILLARD W. EGGLESTON, Rutland, Vermont.

[Since the receipt of the above note, specimens of *Hudsonia ericoides* from the same locality have been exhibited to the NEW ENGLAND BOTANICAL CLUB by Mr. F. W. Bachelder, who reports the station as covering a considerable tract of rocky ground. — ED.]

At the annual meeting of the New England Botanical Club, held December 1, 1899, the following officers were elected for the year 1900: president, Roland Thaxter; vice-president, Walter Deane; corresponding secretary, Edward L. Rand; recording secretary and treasurer, Emile F. Williams; phaenogamic curator, Merritt L. Fernald; cryptogamic curator, Hollis Webster; councillors, Frank S. Collins, Nathaniel T. Kidder and Benjamin L. Robinson.

Vol. 1, No. 12, including pages 215 to 243, plate 11, and title-page of the volume, was issued December 4, 1899.



From photographs.

WITCHES' BROOMS FORMED ON THE WHITE SPRUCE BY *ARCEUTHOBIVM PUSILLUM*.



C. E. Faxon del.

ARCEUTHOBIMUM PUSILLUM ON THE BLACK SPRUCE.



WITCHES' BROOM FORMED ON THE LARCH BY *WITCHES' BROOM* *HOBBIUM PUSILLUM*

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
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